Cable Beach, Rye

BEACH WATER QUALITY REPORT
SUMMER 2006

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NEW HAMPSHIRE DEPARTMENT OF
Environmental Services

BACKGROUND

The New Hampshire Department of Environmental Services (DES) has operated a Public Beach Inspection Program, or Beach Program, for over 20 years. An established coastal beach monitoring program began in 1989 and the program continues to provide monitoring on a weekly basis. DES recognizes the health threat at public beaches. As a result, increased beach monitoring and bacteria source tracking have been implemented to further protect public health.

Coastal beaches are monitored for the presence of the fecal bacteria Enterococci. These fecal bacteria are present in the intestines of warm-blooded animals including humans. Fecal bacteria, when present in high concentrations and ingested, can commonly cause gastrointestinal illnesses such as nausea, vomiting and diarrhea. They are also known as indicator organisms, meaning their presence in water may indicate the presence of other potentially pathogenic organisms.

In October of 2000, the United States Environmental Protection Agency (EPA) signed into law the Beaches Environmental Assessment and Coastal Health (BEACH) Act. The BEACH Act is an amendment to the Clean Water Act, which authorizes the EPA to award grants to eligible states. The purpose of the BEACH Act is to reduce the risk of disease to users of the nation's recreational waters. BEACH Act grants provide support for development and implementation of monitoring and notification programs that help protect the public from exposure to pathogenic microorganisms in coastal recreation waters.

DES received grant funding in 2002 to develop and implement a beach monitoring and notification program consistent with EPA's performance criteria requirements published in the *National Beach Guidance and Required Performance Criteria for Grants* document (www.epa.gov/waterscience/beaches/grants). DES has successfully met all requirements and continues to expand the monitoring and notification program. In 2002, only nine coastal beaches were monitored, while in 2003 and 2004, 15 and 16 beaches respectively, were monitored on a routine basis. Fifteen beaches were sampled again in 2005 and 2006. In 2004, volunteers sampled Star Island beach, but circumstances did not allow for this cooperative effort in 2005 and 2006.

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Beach Description

Cable Beach is owned and maintained by the Town of Rye, New Hampshire. Cable Beach is comprised of a soft sand substrate having a total beach length of 2,532 feet. The beach is frequently used by residents and vacationers for various recreational activities. There are five access points to the beach area from the neighborhood (Figure 1.) There are lifeguards present and toilet facilities available throughout the summer.

Figure 1. Cable Beach Access Points

Gulls and plovers are the most frequent waterfowl observed at this beach. Gulls are present throughout the summer while the plovers are present towards the middle of the summer. Although there are beach restrictions to keep dogs off the beach, dogs are allowed before and after beach hours. Other observations this year include one dog, a dead fish and horse fecal matter.

Below is a brief description of the sampling stations at Cable Beach, Rye. The stations are pictured in Figure 2. For all stations, parking is available by permit on Cable Road along Route 1A. Enter the beach via the main entrance at Cable Road.

Table 1. Station Descriptions

Description	Latitude	Longitude
Left sample station: located eight houses to the north of the main beach entrance. The sample is collected in front of the eighth house.	42˚ 59' 26.3135"	-70˚ 45' 27.3115"
Center sample station: located three houses to the south of the main entrance. The sample is collected in front of the third house.	42˚ 59' 21.6325"	-70˚ 45' 33.6263"
Right sample station: normally accessed from Jenness Beach. The sample is collected in front of the residence with a large flagpole at the southern end of Cable Beach.	42˚ 59' 13.6529"	-70˚ 45' 39.4044"

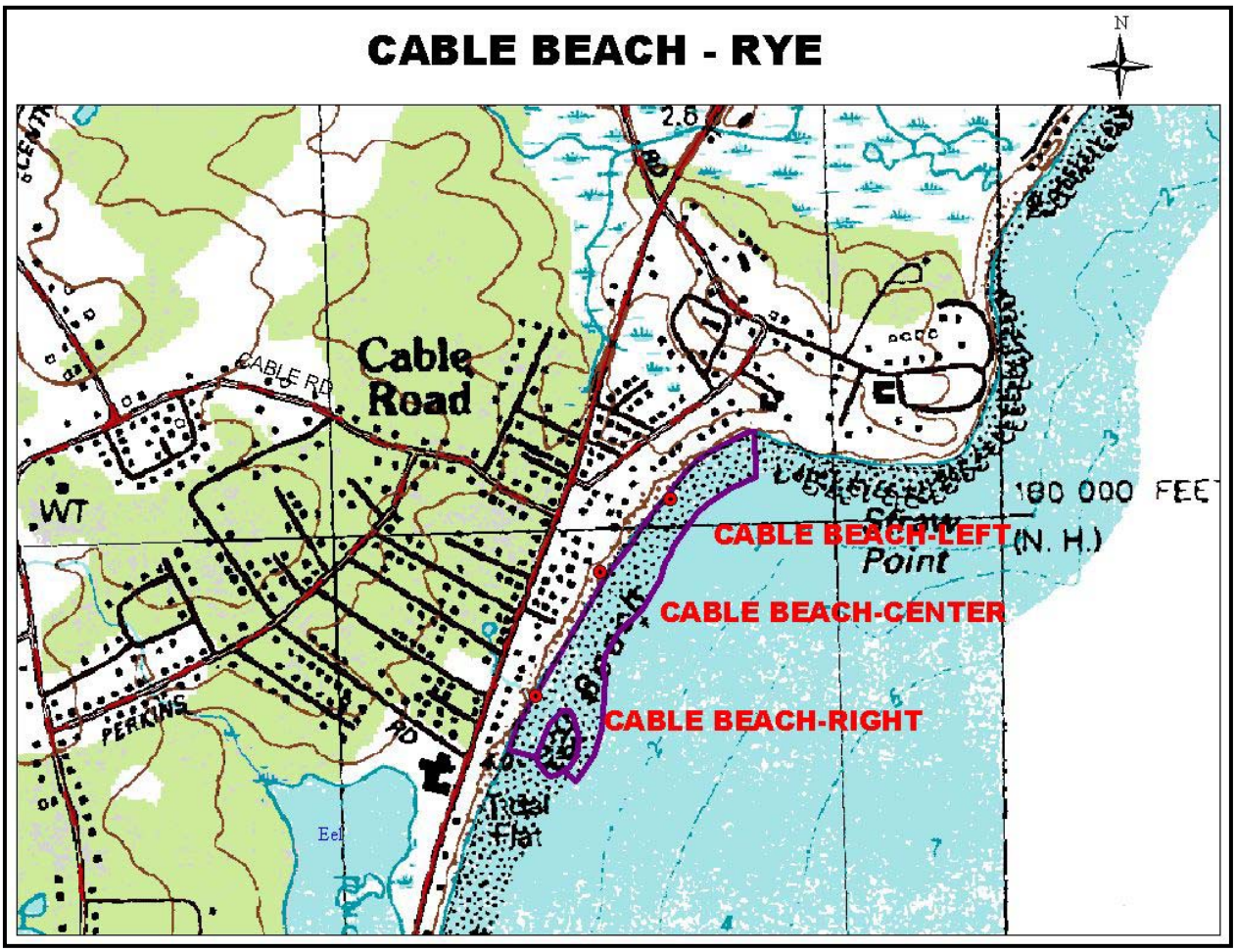

Figure 2. Map of Cable Beach

Tier Status and Sampling Frequency

The Beach Program developed a risk-based beach evaluation process and tiered monitoring approach and implemented this approach during the 2003 beach season. Beach evaluations are conducted annually to determine potential health threats to the public. Evaluations are based on several criteria in three main categories: beach history, microbial pathogen sources, and beach use. The evaluations for the 2006 season included a new criterion to assess beaches. Beaches are now assessed as impaired for bacteria. Impairments are based the most recent version of the Consolidated Assessment and Listing Methodology (CALM) submitted to EPA by DES every two years. The CALM assesses beach units as impaired based on historical exceedances of both the single sample and geometric mean bacteria standards.

Based on these criteria, beaches were assigned a Tier I-Impaired, Tier I or Tier II status in 2006. Tier I-Impaired beaches are high priority and have an increased potential to affect public health, Tier I are medium priority, while Tier II are low priority beaches that have less potential to affect public health. Beach sample frequency is based on the Tier statuses; Tier I-Impaired beaches

were sampled twice per week, Tier I beaches were sampled once per week, and Tier II beaches were samples once every other week in 2006.

Cable Beach is a Tier I-Impaired beach. It was categorized as a Tier I-Impaired beach based on the Beach Program's Risk-Based Evaluation ranking system. This ranking reflects the exceedances of the state bacteria standard in 2005. The beach ranking has changed since the ranking system was implemented in 2002. Cable Beach was previously classified as a Tier I beach. Water samples are now collected twice per week at Cable Beach.

Water Quality

Beaches are monitored to ensure compliance with State Water Quality Standards. Marine waters are analyzed for the presence of the fecal bacteria Enterococci. Enterococci are known as indicator organisms, meaning their presence may indicate the presence of other pathogenic organisms. The state standard for Enterococci at public beaches is 104 counts/100 mL in one sample, or a geometric mean of 35 counts/100 mL in three samples collected over 60 days. Standard exceedances require the issuance and posting of a beach advisory. Beach advisories remain in effect until subsequent beach sampling indicates safe water quality conditions.

The number of samples collected at each beach is a function of beach length. Beaches less than 100 feet in length are sampled at left and right locations 1/3 of the distance from either end of the beach. Beaches greater than 100 feet in length are bracketed into thirds and sampled at left, center and right locations. Routine sample collection may be enhanced by sampling known or suspected pollution sources to the beach area. Storm event sampling may be conducted at beaches where wet-weather events are expected to affect beach water quality.

The 2006 season's weather can best be described as unpredictable. The sampling season began on May 30. During the month of May, New Hampshire experienced flood conditions typical of a 100-year flood, while the months of June and July were wetter and warmer than normal, and August was unseasonably cool and dry. May experienced over 17 inches of rain setting a record high for the month, and over eight inches of rain fell during June (as recorded at Pease International Tradeport, Portsmouth, N.H.). Precipitation was recorded on 34 days of the 95 day sampling season. Twenty-two beach days (beach hours 9:00a.m. to 5:00p.m.) were directly affected by precipitation. There were a total of 27 routine inspections performed at Cable Beach and 71 samples collected in 2006.

Table 2 includes the Enterococci data from each sampling event in 2006. Overall, the summer 2006 Enterococci levels were low and within the state's standards for public beaches. Bacteria levels at the right sample station were elevated to 130 cts/100 mL on July 12. The beach was re-sampled on July 14 and bacteria levels were within the state standards for designated beaches. Neighboring Jenness Beach State Park had elevated bacteria levels the same day as high levels were measured at cable Beach. The left sample station at Jenness Beach had similar bacteria levels. Greater than 1.5" of rainfall fell prior to sampling. The rainfall and associated stormwater runoff likely washed bacteria from the watershed into the beach area. Several local beaches in the area experienced similar occurrences.

Table 2 lists the 2006 Enterococci results for Cable Beach.

Table 2. Cable Beach Enterococci Data 2006

Date Sampled	Sample Station	Enterococci Results (counts per 100 mL)
6/1/2006	Left	10
	Center	5
	Right	10
6/5/2006	Left	10
	Center	10
	Right	10
6/8/2006	Left	20
	Center	20
	Right	10
6/14/2006	Left	10
	Center	10
	Right	10
6/15/2006	Left	10
	Center	60
	Right	10
6/20/2006	Left	10
	Center	10
	Right	10
6/22/2006	Left	40
	Center	10
	Right	10
6/26/2006	Left	10
	Center	10
	Right	10
6/29/2006	Left	10
	Center	10
	Right	10
7/6/2006	Left	10
	Center	10
	Right	10
7/10/2006	Left	10
	Center	10
	Right	10
7/12/2006	Left	10
	Center	10
	Right	130
7/14/2006	Left	10
	Center	10
	Right	10

7/17/2006	Left	10
	Center	10
	Right	10
7/19/2006	Left	10
	Center	10
	Right	10
7/25/2006	Left	10
	Center	10
	Right	10
7/26/2006	Left	10
	Center	10
	Right	10
8/1/2006	Left	10
	Center	10
	Right	10
8/2/2006	Left	10
	Center	10
	Right	5
8/7/2006	Left	30
	Center	10
	Right	10
8/9/2006	Left	50
	Center	10
	Right	20
8/14/2006	Left	20
	Center	10
	Right	5
8/17/2006	Left	10
	Center	10
	Right	10
8/22/2006	Left	20
	Center	10
	Right	10
8/23/2006	Left	10
	Center	10
	Right	5
8/28/2006	Left	10
	Center	10
	Right	10
8/30/2006	Left	10
	Center	5
	Right	10

Figure 3 depicts the relationship between Enterococci results and the state standard for coastal beaches.

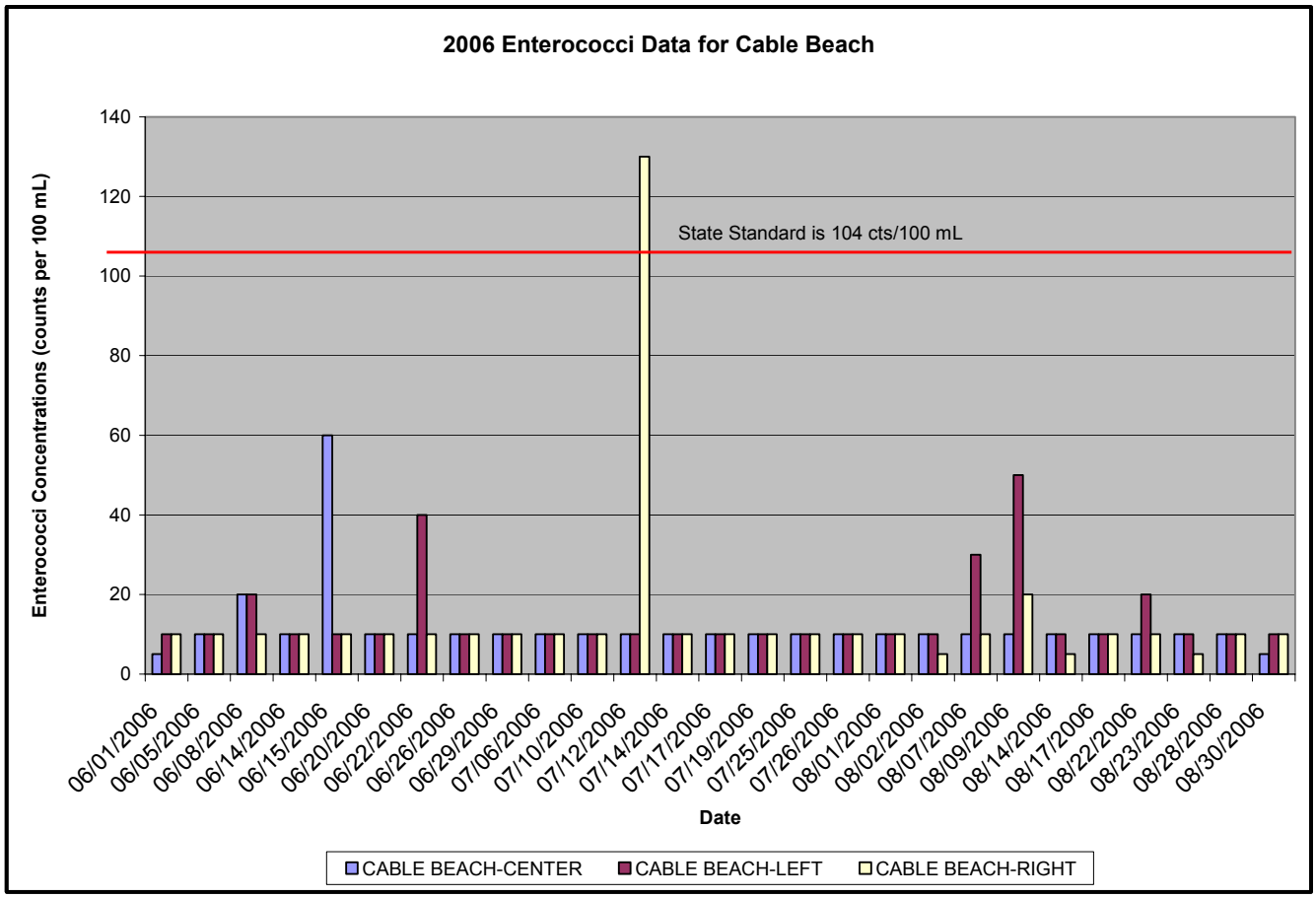

Figure 3. Cable Beach Enterococci Data 2006

Areas of Concern

There are no obvious areas of concern at Cable Beach. The surrounding area is residential and the beach is a popular site for residents and vacationers. People have often been observed walking dogs on Cable Beach. As long as pet wastes are cleaned up from the beach area, there should be no water quality concerns. These wastes have the potential to increase bacteria concentrations in swimming areas. Young children may contact feces while playing in the sand, causing a potential health risk. The Town is proactive and has installed signs and plastic bags so dog walkers are educated to remove pet wastes.

The Eel Pond outlet is located between Sawyer and Jenness Beaches. During large storms, the discharge can potentially supply increased bacteria loads to coastal waters. Depending on near shore circulation patterns, these bacteria laden waters could impact the water quality at Cable Beach. Eel Pond outlet is typically not a cause for concern to Cable Beach.

Thoughts for the Future

- The Town of Rye, local businesses, or school groups should participate in DES's Adopt-a-Beach Program. The program would consist of beach clean-ups and water quality monitoring. DES would conduct training sessions and participate in education and outreach activities for the community. If you are interested, please contact Alicia Carlson at (603) 271-0698 or acarlson@des.state.nh.us.

- The Beach Program applauds the Town for providing trash receptacles for the public to dispose of waste. Beach Program personnel have received complaints in the past concerning the lack of trash receptacles at the beach. Trash receptacles will help reduce litter along the beach making the area more aesthetically pleasing to the public. It may also keep marine waterfowl off the beach reducing the amount potential fecal contamination.

Appendix A

Special Topic 2006

Rapid Assessment Methodology for the Detection of Microbiological Indicators

To assess beach water quality, the Department of Environmental Services (DES) monitors fecal indicator bacteria levels at coastal beaches on a routine basis. Unfortunately, results from sample analysis can take anywhere from 24 to 48 hours. Because it takes at least 24 hours to receive results, beach managers and the public are not informed of water quality problems until after the public may have been exposed. This is an issue facing beach officials throughout the world, and is a priority of the US Environmental Protection Agency (EPA). The EPA, universities and private entities are researching rapid assessment methods to enumerate bacteria and viruses. These methods will allow beach officials to post advisories on the same day water quality is impaired, thus, better protecting public health. There are three different rapid assessment method technologies available: Molecular surface recognition, nucleic acid detection and enzyme/substrate based methods. All rapid assessment methods will take less than two hours to obtain results.

Molecular surface recognition methods capture and/or label the target bacterium by binding to molecular structures on the exterior surface or in its genetic material. Analyses of coastal beach water samples currently employ culture-based methods for the detection of Enterococci bacteria, an indicator for fecal pollution in marine water. The quickest culture-based method takes up to 24 hours to provide results. Now, a new method is being developed to enumerate Enterococci. This new method uses Transcription-Mediated Amplification (TMA) with a fluorescently-labeled probe to amplify a specific region of Enterococci ribosomal RNA (rRNA).

The TMA rapid assessment method is currently being tested in Southern California. Method development is moving quickly and will likely come to execution within five years. Method cost is a significant reason the new technology is not currently employed. Once this procedure is widely and routinely accepted, the expenses should lower. This rapid assessment method is very beneficial as it will allow beach managers to take immediate action towards protecting the public from waterborne pathogen exposure on the same day water is sampled.

Another rapid assessment method being developed for fecal indicator detection is Quantitative Polymerase Chain Reaction (QPCR). QPCR is a nucleic acid detection method that targets genetic material of bacteria, viruses or protozoan indicators. QPCR is used to test for both *E. coli* and Enterococci. Results can be obtained from this method on an average of two hours after sampling. This method has demonstrated 85-90 percent agreement with existing routine methods. QPCR can be used to detect other water quality indicators such as *Bacteroides*

thetaiotamicron and human enterovirus. Studies indicate that ratios of *B. thetaiotamicron* may provide useful information as to fecal contamination sources.

The final rapid assessment technology methods available are the enzyme/substrate based methods. These methods pair chromogenic or fluorogenic substrate methods already widely used with advanced optical or electrical detectors. These methods are directed at reducing the incubation periods of current membrane filtration methods. Some of these methods measure excitation and absorbance of the fluorescent metabolite of Enterococci using a fluorometer to speed the detection rate. A popular type of enzyme/substrate method is called Dual-Wavelength Fluorimetry (DWF).

These rapid assessments methods are currently being tested for accuracy, sensitivity and efficiency. Research indicates that these new methods will be made available within the next five years. Once these technologies are made available and laboratories adopt the methods, beach management will have a new tool to better protect public health. With assistance from EPA Beach Grants, New Hampshire will be proactive in employing accepted methods.